

Payment will be made under

Item No. 528	Epoxy Pressure Injection of Concrete Cracks, Bridge No. ____	Per lump sum
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### 528.5.01 Adjustments

General Provisions 101 through 150.

## **Section 529—Navigation Lighting**

### **529.1 General Description**

This work consists of furnishing and installing navigation lighting (complete or to the extent indicated on the Plans) on bridges and on fender systems where required on the Plans and approved Shop and Work Drawings.

The Specification's intent is to secure a complete, operational system according to the National Electrical Code and applicable local ordinances.

#### **529.1.01 Definitions**

Qualified Electrician: A journeyman electrician with one of the two following classifications:

- Has a Class II license issued by the Georgia State Construction Industry Licensing Board
- Has completed an approved four-year apprenticeship training program

#### **529.1.02 Related References**

##### **A. Standard Specifications**

Section 500—Concrete Structures

Section 645—Repair of Galvanized Coatings

Section 852—Miscellaneous Steel Materials

Section 863—Preservative Treatment of Timber Products

Section 921—Luminaries

Section 922—Electric Wire and Cable

Section 923—Electrical Conduit

Section 924—Miscellaneous Electrical Materials

##### **B. Referenced Documents**

National Electrical Code

ASTM A 123/A 123M

#### **529.1.03 Submittals**

##### **A. Contractor Qualifications**

The Contractor performing this work must be on the Department's list of approved electrical contractors or electrical subcontractors.

##### **B. Product Lists**

To avoid misunderstanding and ensure compliance with the Specifications, submit to the Engineer for approval a complete list of the products proposed for use before purchasing materials or equipment. Products must comply with Plan requirements to be approved.

The product list shall include the following information:

- Manufacturer's name for each item
- Manufacturer's catalog number for each item

Where the Engineer deems necessary, alternate equipment will be specified.

##### **C. Fees and Permits**

Pay the fees and obtain the permits required by power companies and governmental agencies.

## 529.2 Materials

All electrical material shall be approved by the Underwriter's Laboratory or other acceptable testing agency.

Ensure that materials conform to the requirements of the following Specifications:

Material	Section
Wood Pole	863
Disconnect Switch	924.2.05
Magnetic Contactor	924.2.07
Lightning Arrester	924.2.03
Miscellaneous Electrical Materials	924
Electrical Conduit	923
Ground Rod	924.2.01
Luminaries and Lamps	921
Electrical Wire and Cable	922
Miscellaneous Steel Materials	852
Photoelectric Control	924.2.06

If this Specification or the Plans omit any item needed to install and operate the navigation lighting satisfactorily, include the item in the system.

If necessary, have a qualified person (including a Registered Professional Electrical Engineer) check, verify, or modify (with the Department's permission) the Contract requirements. The Department will review and approve a person's qualifications.

### 529.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

## 529.3 Construction Requirements

### 529.3.01 Personnel

#### A. Qualified Electrician

Have a Qualified Electrician on the job site when electrical wiring is being pulled or electrical connections are being made.

Ensure that the Qualified Electrician possesses evidence of classification and displays this evidence to the Department's engineer in charge of the construction.

### 529.3.02 Equipment

General Provisions 101 through 150.

### 529.3.03 Preparation

General Provisions 101 through 150.

### 529.3.04 Fabrication

General Provisions 101 through 150.

### 529.3.05 Construction

#### A. Contractor Guidelines

Comply with the following:

- Local ordinances, rules, and regulations
- The Plans

The Plans are not intended to show the complete details of the overall work, but they will indicate the general layout and designate acceptable manufacturers' equipment.

- Approved Shop and Working Drawings, including drawings by others, if any

**B. Contractor Responsibilities**

Take responsibility for the following:

- Provide fittings, devices, materials, and work necessary to install the complete, functional system.  
Any necessary drilling, cutting, patching, galvanizing repair, and other work required because of misplaced or plugged conduit or improper workmanship shall be done without additional compensation and shall be approved by the Engineer.
- Ensure that electrical work is adequate.

**C. Construction Precautions**

When a bridge is under construction, provide the lights and other signals necessary for protecting navigation as may be prescribed by the U.S. Coast Guard.

**D. Galvanized Steel Items**

The following steel items shall be galvanized according to ASTM A 123/A 123M, except the weight of zinc coating per square foot (meter) of actual surface for 1/8 in (3 mm) and 3/16 in (5 mm) steels shall average at least 1.25 oz (375 g) and no individual specimen shall show less than 1.0 oz (300 g).

- Structural steel conduit support angles on fender system
- Junction boxes, except stainless steel
- Conduit clamps and screws
- Luminaire retriever chain and swivel
- Lag screws

Powder-actuated galvanized studs may be of commercial galvanizing quality.

Repair damaged galvanized areas according to Section 645.

**E. Conduit, Boxes, Fittings, Wiring, and Supports**

Furnish and install as required by the National Electrical Code the conduit, boxes, fittings, wiring, supports, and accessories required to complete the work.

**1. Conduit Specifications**

Ensure that conduit connections are waterproof.

Provide approved conduit expansion joints at each bridge expansion joint.

Use flexible conduit when going from the bridge superstructure to the substructure, from the bridge to the fender system, and in the transition areas between rigid members.

**a. Conduit for Service Risers and Bridges**

Unless otherwise shown on the Plans, use 1-1/4 in (32 mm) rigid galvanized steel conduit for the service riser and along the bridge.

**b. Underground Conduit**

Unless otherwise specified on the Plans, use 1-1/4 in (32 mm) nonmetallic conduit for the underground conduit between the service riser and the bridge. Join underground conduit according to the manufacturer's recommendations and bury it at least 24 in (600 mm).

**c. Conduit for the Fender System Walkway**

The conduit placed along the fender system walkway may be 1 in (25 mm) size and shall be either liquid tight flexible conduit or rigid galvanized steel conduit. Use the conduit size specified on the Plans.

**d. Conduit Connections**

Use flexible conduit to connect the rigid galvanized steel conduit located on the faces of pier or bent columns to the conduit located on the fender system walkway.

Ensure this flexible conduit has waterproof couplings and is of sufficient length and slack to permit at least 2 ft (600 mm) of horizontal movement in each direction.

**2. Conduit Installation**

Install conduit as follows:

- a. Install conduit perpendicular to or parallel with the principal structural members.
- b. Fit conduit terminals at the junction boxes with bushings.

- c. Support the rigid galvanized steel conduit at least every 10 ft (3 m) and within 3 ft (1 m) of junction boxes, luminaires, etc.
- d. Use ¼ in (6 mm) galvanized lag screws and clamps to fasten the conduit to the timber walkway of the fender system.

The Contractor may use powder-actuated galvanized studs and clamps to fasten the following items (located underneath the bridge and down the face of pier or bent columns) to the concrete:

- Rigid galvanized steel conduit
- Expansion devices

### 3. Specifications of Pull and Junction Boxes

Pull and junction boxes mounted on bridges and the fender system shall be waterproof; shall be made of galvanized steel, stainless steel, or cast aluminum; and shall comply with the National Electrical Code.

There are two options for providing pull and junction boxes to be installed in the ground:

- Construct the boxes according to the Plan design and dimensions and at the locations shown on the Plans. Construct the concrete boxes of Class A Concrete meeting the applicable requirements of Section 500, including precast concrete boxes.
- Furnish and install manufactured boxes approved by the Engineer. Manufactured boxes will be permitted when the Engineer determines they are equal to the boxes constructed of Class A concrete in design, quality, and structural strength. Boxes must meet the requirements of Section 500.

Provide with each pull or junction box cast iron, steel, or reinforced concrete covers as shown on the Plans.

### 4. Pull and Junction Box Installation

Install pull and junction boxes as follows:

- a. If necessary, use powder-actuated galvanized studs and clamps to fasten junction boxes located underneath the bridge and down the face of pier or bent columns to the concrete.
- b. Seal conduit entrance holes in pull or junction boxes around the conduit as approved by the Engineer.
- c. Blank off unused entrance holes and openings for conduit to be extended by others with suitable plugs of plastic, bituminous fiber, or other material approved to keep out foreign matter.

### 5. Luminaire Installation

Install luminaires as follows unless otherwise shown on the Plans:

- a. Use the number and diameter of studs, bolts, and lag screws the luminaire manufacturer recommends.
- b. Fasten each channel marker to the bridge with powder-actuated, galvanized, threaded studs or cadmium-plated expansion bolts.
- c. Fasten each fender marker to the timber walkway with galvanized lag screws.

## F. Power Supply and Wiring

Unless otherwise noted, the power supply shall be 120/240 volts, 3-wire, and single phase. The Department and the serving electric utility will agree upon the supply point, which in most cases will be near the Rights-of-Way line near the bridge location.

### 1. Service Pole

Set up a service pole as follows:

- a. To receive the service from the Utility Company (unless otherwise indicated on the Plans or in the Specifications), set up a wood pole that complies with Section 863. The pole shall be at least 30 ft (9 m), Class 5, or as shown on the Plans.
- b. Install the following on the service pole:
  - A metallic service riser with a weatherhead
  - A weatherproof enclosure containing a fusible disconnect switch of the appropriate voltage and ampere rating or as shown on the Plans (see Subsection 529.3.05.H, "Power Control," for information on additional items contained in the waterproof enclosure)
  - An underwriter-approved meter base in the service riser (where required by the power company or where indicated on the Plans)

## G. Grounding System Construction

Furnish and install an approved lightning arrester at the weatherproof enclosure on the service pole and connect it to the grounding system.

### 1. Grounding System

Construct the grounding system as follows:

- Install a ground rod adjacent to the service pole.
- Connect neutral and grounding conductors to the ground rod.
- Install a separate, continuous copper grounding conductor (green) throughout the system.
- Solidly connect metallic, noncurrent carrying materials in the lighting system to the grounding conductor.
- Drive single ground rods vertically until the top of the rod is at least 12 in (300 mm) below the finished ground.
- Attach a length of No. 6 AGW bare copper, 7-stranded wire to the ground rod with suitable ground rod clamps. Connect this wire to the neutral and grounding conductors at the service pole.

### 2. Ground Rod System

When the above procedure does not result in sufficient penetration, construct a ground rod system as follows:

- a. Place 3 parallel ground rods at least 6 ft (1.8 m) center-to-center in a horizontal pattern and at least 12 in (300 mm) below the finished ground.
- b. Joint and connect these rods to the neutral and grounding conductors at the service pole using suitable ground rod clamps and No. 6 AWG bare copper, 7-stranded wire.

## H. Power Control

Unless otherwise specified on the Plans or the Specifications, furnish the following items for each service pole:

- **Photoelectric control complete with receptacle and accessories.** The control shall provide ON operation as indicated under Subsection 924.2.06, "Photoelectric Controls."
- Disconnect switch
- **Magnetic contactor.** The contactor shall supply power to the lighting circuit.
- **Transformer.** If the supply voltage is other than 120/240 volts, furnish and install a transformer to provide 120 volt control voltage
- NEMA-3R lockable weatherproof enclosure(s)

The disconnect switch and magnetic contactor shall have the number of poles required to open each ungrounded conductor and shall be accessible from the ground.

Install the following items as follows:

### 1. Install the Photoelectric Control

- a. Mount the photoelectric control near the top of the service pole.
- b. Direct the photoelectric control toward the north sky.
- c. Enclose wiring to and from the photoelectric control in rigid galvanized conduit.

The photoelectric control shall operate the magnetic contactor.

### 2. Install the Disconnect Switch, Magnetic Contactor, and Transformer

Mount the disconnect switch, magnetic contactor, and transformer, if required, in NEMA-3R lockable weatherproof enclosure(s) on the service pole.

### 3. Install the Weatherproof Enclosure

- a. Install the weatherproof enclosure(s) so that it is accessible from the ground.
- b. Furnish a padlock(s) approved by the Engineer with two keys each for locking the weatherproof enclosure(s).  
When a project requires more than one padlock, key the padlocks alike.

## 529.3.06 Quality Acceptance

### A. Inspection of the Navigation Lighting System

Materials and workmanship shall meet the requirements of the Plans and these Specifications and shall comply with the National Electrical Code.

The Work shall be inspected by the Department, the utility company involved, and the U.S. Coast Guard. The navigation lighting system shall be approved by both the Department and the U.S. Coast Guard.

If the Coast Guard fails to make its inspection within 30 days, the Department and the utility company will make the final inspection of the navigation lighting system. The Contractor will be relieved of any further responsibility for the system after Department acceptance.

**B. Testing and Acceptance of the Navigation Lighting System**

Final acceptance of the navigation lighting system will be withheld for a testing period of 30 days. The testing will consist of continuous, nightly, automatic operation after the Contractor completes the lighting work or until all other items in the Contract (except grassing) have been accepted, whichever occurs later. Assume the cost of the electrical energy consumed during the testing period.

Correct any defects in materials or workmanship that occur during the testing period at the Contractor's expense.

Any portion of the testing period (Subsection 529.3.06.B, "Testing Acceptance of the Navigation Lighting System") that occurs after final acceptance of the other Work will not be charged against the Contract Time.

**529.3.07 Contractor Warranty and Maintenance**

General Provisions 101 through 150.

**529.4 Measurement**

Each navigation lighting system completed and accepted at the location specified will be measured for payment on a lump sum basis. See Subsection 529.1, "General Description.")

**529.4.01 Limits**

General Provisions 101 through 150.

**529.5 Payment**

Each navigation lighting system completed and accepted at the location specified will be paid for at the Lump Sum Price bid for each system. This payment shall be full compensation for furnishing and installing materials and for labor, equipment, and incidentals necessary to complete the Item.

Payment will be made under:

Item No. 529	Navigation lighting, bridge no. _____	Per lump sum
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**529.5.01 Adjustments**

General Provisions 101 through 150.

**Section 530—Waterproofing Fabrics**

**530.1 General Description**

This work consists of waterproofing concrete and other masonry surfaces by preparing and applying a composite waterproofing membrane at locations shown on the Plans.

**530.1.01 Definitions**

General Provisions 101 through 150.

**530.1.02 Related References**

**A. Standard Specifications**

Section 500—Concrete Structures

**B. Referenced Documents**

General Provisions 101 through 150.

**530.1.03 Submittals**

General Provisions 101 through 150.